Explore

QCD Emerging Property

at RHIC

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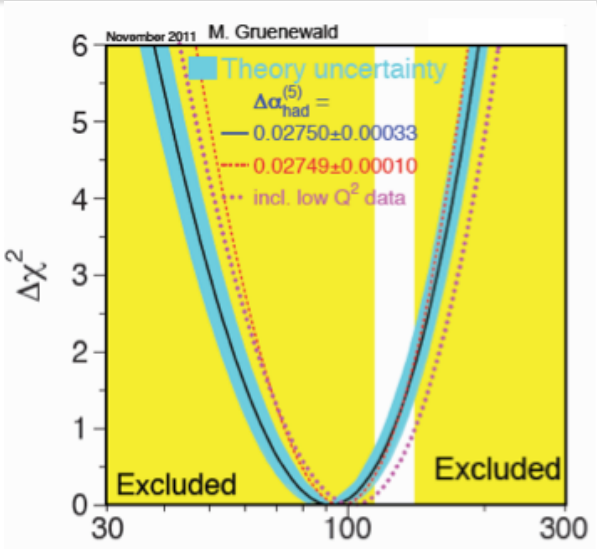
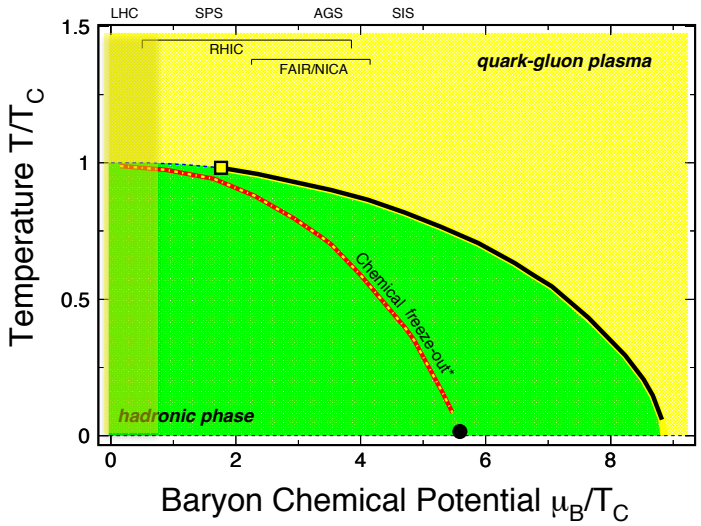
Many Thanks to the Organizers!

QCD in Twenty-One Century



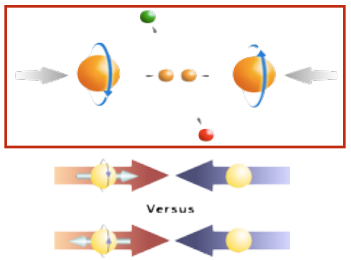


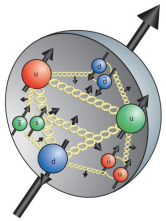
(1) Higgs Particle –
- Origin of Mass
- SM ➔ The *Theory*

(2) QCD Phase Structure –
- Confinement
- χ_C symmetry
- Critical point, phase boundaries
- Nucleon helicity structure
- …
- Non-linear QCD at small-x
- …

Emerging properties with QCD degrees of freedom!

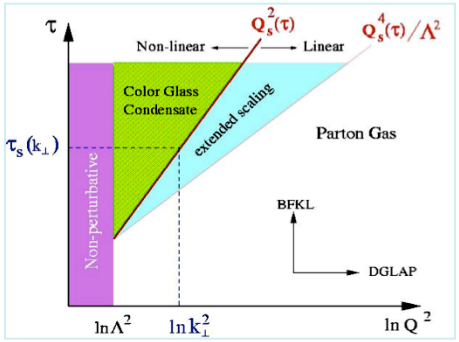
STAR Physics Focus





Polarized *p+p* Program

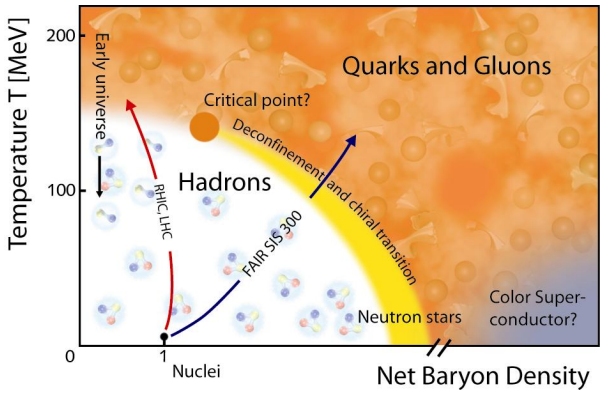
- Study ***proton intrinsic properties***



Small-x Physics Program

- Study low-x properties, initial condition, search for ***CGC***
- Study elastic and inelastic processes in pp2pp

2020 -
eRHIC
(eSTAR)



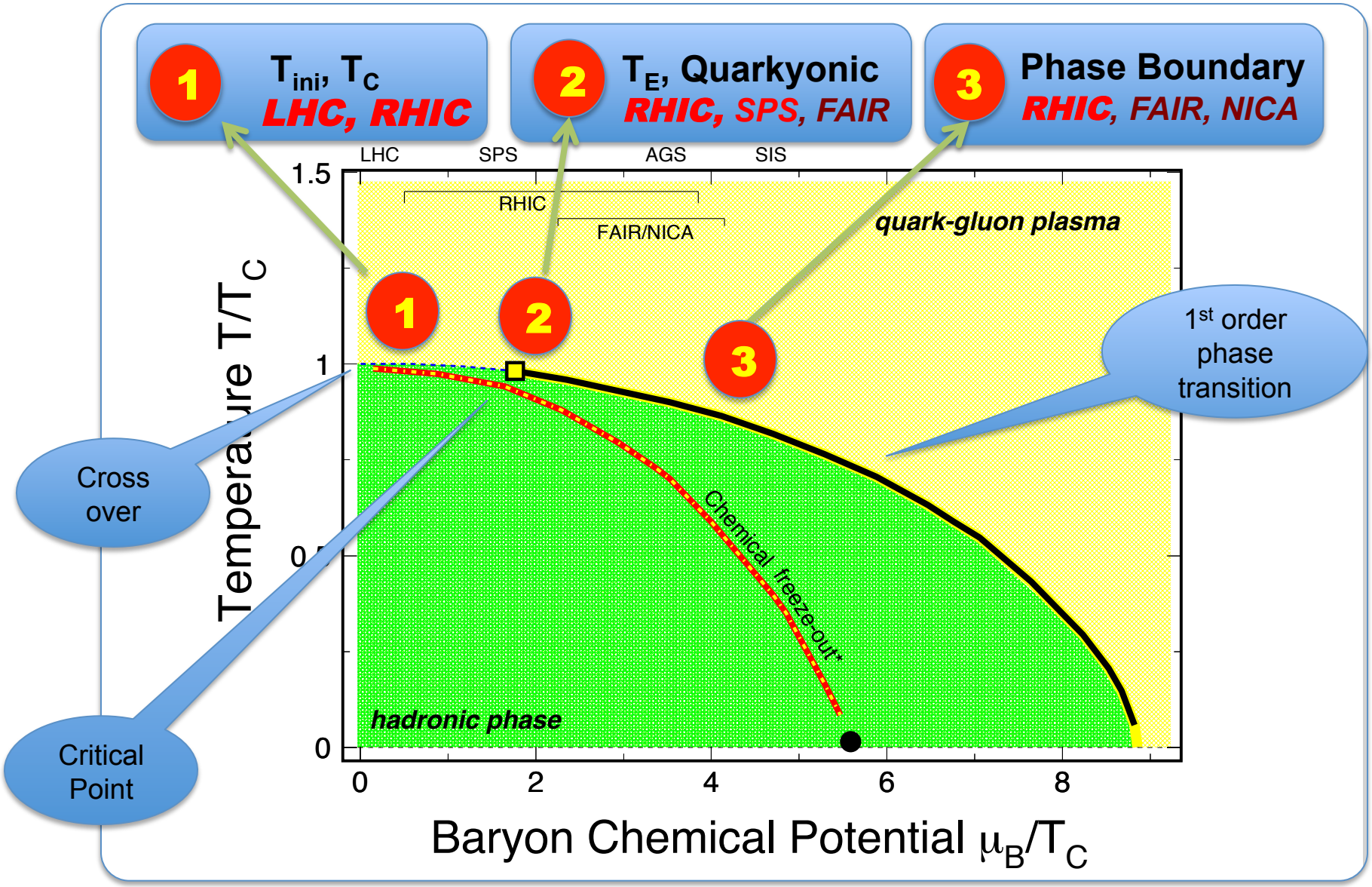
1) At 200 GeV at RHIC

- Study ***medium properties, EoS***
- pQCD in hot and dense medium

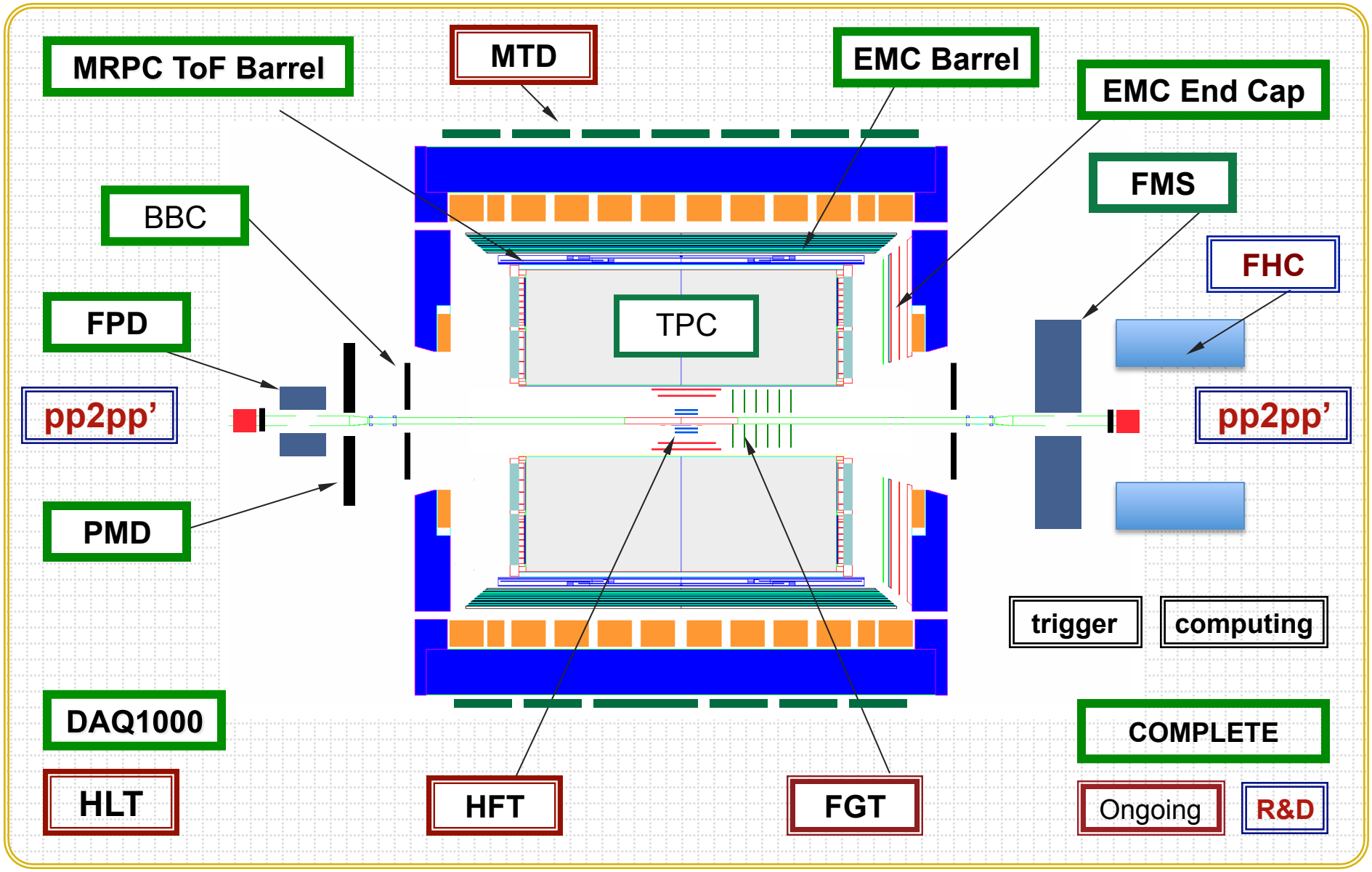
2) RHIC Beam Energy Scan (BES)

- Search for the ***QCD critical point***
- Chiral symmetry restoration

The QCD Phase Diagram and High-Energy Nuclear Collisions



STAR Experiment



STAR Detector Configurations

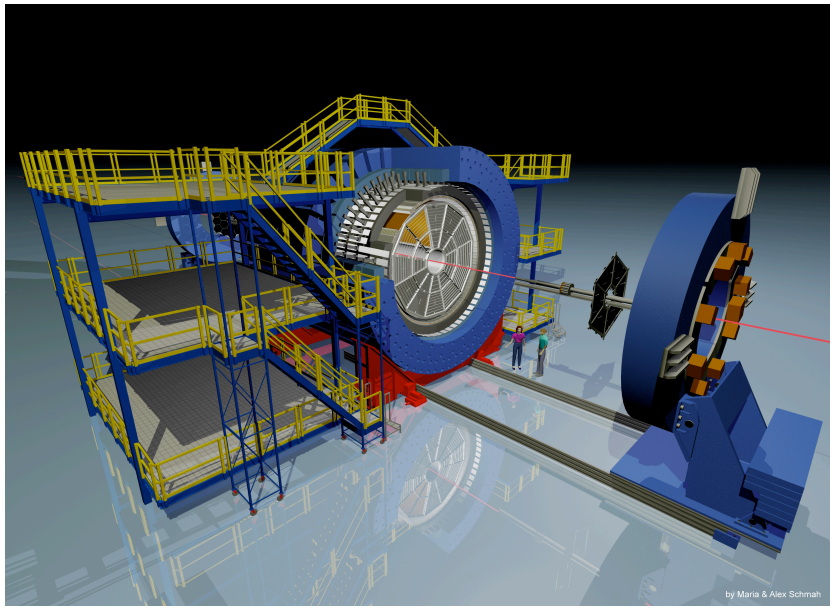
1) Before 2010: TPC
2) 2010: TPC + TOF
3) 2013: TPC + TOF + MTD'
4) 2014: TPC + TOF + **HFT + MTD**

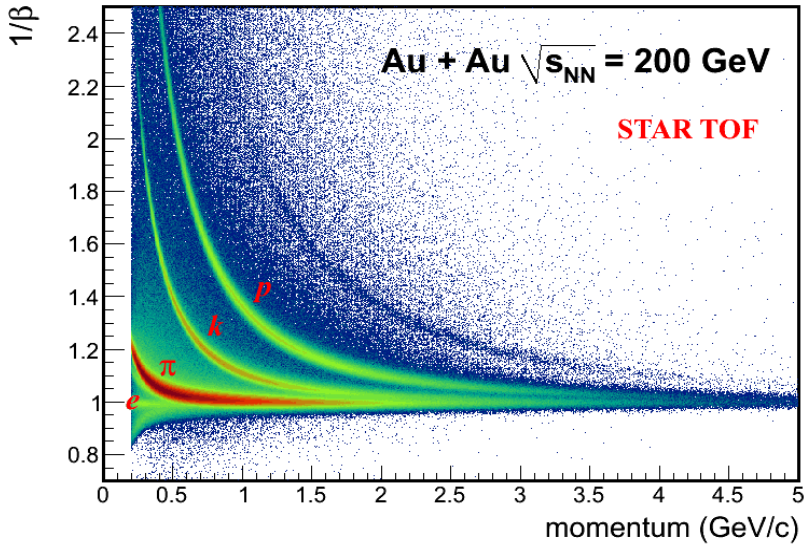
➔ **Large coverage, excellent particle ID, fast DAQ**

- detector all particles produced at RHIC, except neutrinos
- multiple fold correlation measurements
- **BES-I:** 7.7 < $\sqrt{s_{NN}}$ < 39GeV // **BES-II**: $\sqrt{s_{NN}}$ < 20GeV, high luminosity
- **Probes:** bulk, penetrating, and *bulk-penetrating*

➔ **STAR: Perfect Mid-y Collider Experiment**

TOF and di-lepton Measurements





di-leptons:

Bulk Penetrating Probe!